ABSTRACT OF THE DISCLOSURE

The present invention-provides a tunnel-injection device which encompasses, a reception layer made of a first semiconductor, a barrier-forming layer made of a second semiconductor having a bandgap-narrower than the first semiconductor, being in metallurgical contact with the reception layer, a gate insulating film disposed on the barrier-forming layer. The gate electrode controls the width of the barrier generated at the heterojunction interface between the reception layer and the barrier-forming layer so as to change the tunneling probability of carriers through the barrier. The device further encompasses a carrier receiving region being contact with the reception layer and a carrier-supplying region being contact with the barrier-forming layer.